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On the Action of Alkalis and Acids on Rubber

By B. J. Eaton.

In a previous number of the Agricultural Bulletin (Vol. iv. No. 2. November 1915) it was shown that solutions of caustic soda and sodium carbonate had a marked effect in accelerating the rate of cure of plantation Para rubber and from previous work on the retardation in rate of cure caused by coagulating with an excess of acetic acid, it was suggested that the acceleration in rate caused by soda might be due possibly to a neutralisation of residual acid and the production of a more suitable medium for the organisms to which the changes brought about in rubber causing acceleration in rate of cure are attributed.

In view however of the possibility of the chemical action of alkalis in general in accelerating the rate of cure of rubber further experiments were carried out on finished rubbers, *i.e.*, rubbers in crepe form, in which the possibility of biological action had been eliminated by the dryness of the samples. Two types of rubber were chosen, *viz.* a fast and slow curing rubber, the former being prepared in the usual manner by crepeing slab rubber after standing for at least six days and the latter by crepeing the fresh coagulum on the day of coagulation.

In the meanwhile however my attention had been directed to a paper entitled "The effect of acids and alkalis on rubber, more especially in relation to reclaimed rubber" which was read by Martin of the North British Rubber Company before the International Rubber Congress at the International Rubber and Allied Trades Exhibition held in London in 1914 and published in "The Rubber Industry" 1915. No attention had been paid to this paper before, as the writer was not specially interested in reclaimed rubber to which the paper particularly refers.

It was found however that Martin had carried out experiments, not only with rubber prepared by the two principal reclaiming processes in which the rubber is treated with either alkalis or sulphuric acid, but also on raw rubber which had been subjected to the action of alkalis and of sulphuric acid respectively and although the experiments were carried out under different conditions and with different mixings to those used in our Experimental Vulcanising Factory, Martin had arrived at the same conclusions *viz.* that alkalis accelerated the rate of cure of rubber up to a certain proportion, while larger proportions again retarded the rate of cure, whereas sulphuric acid, on the other hand, retards the rate of cure in all proportions.

At this time also, comparative experiments were being carried out by me with the following coagulants:—Acetic acid, Formic acid, Citric acid, Oxalic acid, Hydrofluoric acid, Sulphuric acid, Hydrochloric acid and Potash alum and in these experiments it was found that, in the preparation of slab rubbers, Acetic, Formic, Citric and Oxalic acids, when used as coagulants in minimum quantity, gave rubbers which were practically equal in behaviour in respect to rate of cure. On the other hand, similar slabs coagulated by minimum quantities of Hydrofluoric, Sulphuric and Hydrochloric acids and by Potash alum, all cured more slowly, Hydrofluoric acid having the least effect, followed by Sulphuric acid, then Hydrochloric acid and finally Potash alum which had the greatest effect in decreasing the rate of cure. In view of the results obtained by Martin with rubbers treated with Sulphuric acid it would appear therefore that the retardation in rate of cure produced by these coagulants is a chemical effect and due probably to the "adsorption" of these chemicals by the rubber.

The effects of different coagulants will be dealt with in a future paper, but in view of the importance of the results obtained, and their bearing on estate practice, the conclusions will be summarised here.

ACTION OF ALKALIS ON RUBBER.

In the experiments under discussion, solutions of caustic soda (sodium hydroxide) and caustic potash (potassium hydroxide) were used as the alkalis, on account of the marked effect of sodium hydroxide in the previous experiments.

The following samples were prepared and vulcanised:—

The samples taken as controls were a fast curing crepe prepared from slab (No. 157) and slow curing crepe, machined on the day of coagulation (No. 155).

180 A. Fast curing rubber soaked for 24 hours in 1 per cent caustic soda then recreped.

B. Fast curing rubber soaked for 24 hours, and recreped after 10 days.

C. Fast curing rubber soaked for 24 hours, then soaked in dilute acetic acid 24 hours and recreped.

D. Fast curing rubber soaked in 1 per cent caustic potash for 24 hours then recreped.

E. Fast curing rubber soaked in 1 per cent caustic soda for 24 hours, and after 10 days soaked in dilute acetic acid for 24 hours and then recreped.

F. Fast curing rubber soaked in 1 per cent caustic potash for 24 hours, and recreped after 10 days.

G. Slow curing rubber treated similarly to A.

H. do. treated similarly to D.

J. do. treated similarly to B.

K. do. treated similarly to F.

L. Control sample fast curing rubber. (No. 157).

M. „ „ slow curing rubber. (No. 155).

180 A.	$1\frac{1}{4}$-$1\frac{1}{2}$	1.53	979	1497
B.	1 -$1\frac{1}{4}$	1.45	999	1448
C.	$1\frac{1}{2}$-$1\frac{3}{4}$	1.44	934	1344
D.	$1\frac{1}{4}$	1.21	947	1145
E.	$\frac{3}{4}$-1	1.41	943	1329
F.	1 -$1\frac{1}{4}$	1.47	947	1391
G.	$\frac{3}{4}$-1	1.48	948	1403
H.	$\frac{1}{2}$- $\frac{3}{4}$	1.17	933	1091
J.	$\frac{1}{2}$- $\frac{3}{4}$	1.20	928	1113
K.	$1\frac{1}{4}$-$1\frac{1}{2}$	1.41	945	1332
L.	$1\frac{3}{4}$	1.47	962	1414
M.	$3\frac{1}{4}$-$3\frac{1}{2}$	1.20	978	1198

The rates of cure compared with a standard curve shewn by the load-stretch curves are as follows:—

H and J equal at $\frac{1}{2}$ to $\frac{3}{4}$ hour, E and G equal at about $\frac{3}{4}$ to 1 hour, B and F equal at about 1 hour, D at 1-$1\frac{1}{4}$ hours, A and K equal at about $1\frac{1}{4}$ hours, C at $1\frac{1}{2}$ hours, L at $1\frac{1}{2}$-$1\frac{3}{4}$ hours, and M at $3\frac{1}{4}$-$3\frac{1}{2}$ hours.

Conclusions:—As will be observed from the above results the effects of potash and soda are very similar and the effects are as great or greater in the case of the slow curing rubber as in the fast curing rubber. The irregularity however of the effects in the

case of the fast and slow curing rubbers may be due to the different amounts of the chemicals absorbed by the rubbers, which are not washed out to the same extent in the subsequent crepeing.

It will be seen that in sample 180 C the effect of neutralising the alkali on the following day with acetic acid is to cause the rubber to return almost to its original cure, whereas after the alkali remaining in the rubber for 10 days has been neutralised with acetic acid the rubber (No. 180 E) cures much more rapidly than the control.

Since the possibility of biological action has been eliminated in this experiment by working on finished dry crepes, the action of alkalis (soda and potash) is evidently a chemical action, but whether due to the action of these alkalis qua alkalis, or to their effect on an accelerating agent in the rubber is not quite certain, since in the above experiments the evidence is not complete, and none of the slow curing rubbers treated with alkali were subsequently treated with acetic acid. The evidence is however in favour of some chemical action on a constituent of the rubber.

EFFECT OF ACID ON RUBBER.

Although, so far, no experiments have been carried out by soaking finished rubbers in mineral acids, the results of our experiments with different coagulants described above have shown that the mineral acids, hydrofluoric, sulphuric and hydrochloric acids all retard the rate of cure.

In two series of experiment in which different quantities of sulphuric acid were used as coagulants, it was also found that an excess of this acid, in the preparation of slab rubbers, even when only 50 per cent above the minimum quantity necessary for coagulation was used, had a very marked effect, the excess of acid retarding the rate of cure considerably, whereas a similar difference in quantity when using acetic acid has little or no effect.

The importance of this in connection with the proposed substitution of acetic acid by sulphuric acid on account of the present high price of the former is obvious. Unless great care is taken in adopting standard conditions both in respect to dilution of latex and proportion of sulphuric acid used, much greater variability is likely to occur in plantation Para rubber than exists at present. The fortunate choice of acetic acid as a coagulant is also emphasized. Martin, in his paper, refers to the bearing of his results on the use of excess of acetic acid in estate practice, but our experiments have shown that what applies to sulphuric acid and mineral acids and some salts does not necessarily apply to acetic acid.

The experiments with different coagulants are being continued with sheet and crepe samples, since the differences obtained with "slab" rubbers may be more pronounced than in the case of sheet and crepe samples.

The results of soaking fast and slow curing crepe rubbers in dilute solutions of mineral acids will also be tested.

CHEMICAL EFFECT OF SODA ON RUBBER.

In the experiments in which the fresh coagulum was soaked in caustic soda solution on the day after coagulation, it has since been found that this rubber after crepeing, which was at first in good condition and gave excellent results on vulcanisation, has now become very tacky and soft.

This tackiness, produced by soda, has not, as far as we are aware, been remarked previously and may throw considerable light on the subject of tackiness, since this may be a form of tackiness due to depolymerisation. The tacky samples will be vulcanised again and tested.

In view of this effect, the soaking of rubber samples in solutions of soda or potash is not recommended. Solutions of sodium carbonate do not appear to induce the tackiness caused by the solutions of the hydroxide, at any rate no tackiness has yet appeared on samples treated at the same time.

CONCLUSIONS.

1. The effect of alkalis on rubber, in the case of sodium and potassium hydroxides is to markedly accelerate the rate of cure.

2. The effect is similar on both slow and fast curing rubbers.

3. The effect of alkalis appears, at present, to be due to some chemical action on some constituent of the rubber, but the evidence on this point is still incomplete and further experiments are being carried out.

4. Sulphuric, and other mineral acids and potash alum and probably other mineral salts retard the rate of vulcanisation, the effect being more marked with quantities beyond the minimum necessary for coagulation.

5. The results obtained with mineral acids are important in connection with estate practice, in view of the probable substitution of sulphuric acid for acetic acid and show that great care will have to be taken in maintaining standard conditions, more so than in the case of acetic acid, in which a moderate excess over the minimum necessary for coagulation has little effect.

Warning.

Since writing this article, I have received an interesting letter from the Works Manager of one of the leading rubber factories in Great Britain, asking me to warn planters against the use of alkalis in the preparation of raw rubber owing to its deteriorating effect on manufactured rubber gods. This entirely confirms the deteriorating effect found to occur even on the raw rubber after keeping.

Notes on Tapping Experiments at Kuala Lumpur.

Third and Fourth Years' Result.

By F. G. Spring.

The results of the first and second years' working of this experiment were published in Vol. I, No. 2 and Vol. 1, No. 9 of the Agricultural Bulletin, Federated Malay States. The present articles deals with the third and fourth years figures but the results, as already published, of the two former years are also given. The experiment is divided into six different systems of tapping which are as follows:—

Plot 1.

System of Tapping:—Quarter (Half Herring bone). Two cuts 18 inches apart, twenty cuts to the inch.

Every day tapping.

Plot 2.

System of Tapping:—Adjacent Quarters (Full Herring bone). Two cuts 18 inches apart on each quarter, twenty cuts to the inch.

Alternate day tapping.

Plot 3.

System of Tapping:—Single V, 36 inches from base of tree. Twenty cuts to the inch.

Every day tapping.

Plot 4.

System of Tapping:—Double V, cuts 18 inches apart, twenty cuts to the inch.

Alternate day tapping.

Plot 5.

System of Tapping:—Opposite Quarters. One cut 36 inches from base of tree on each quarter, twenty cuts to the inch.

Every day tapping.

Plot 6.

System of Tapping:—Opposite Quarters. Two cuts 18 inches apart on each quarter, twenty cuts to the inch.

Alternate day tapping.

The position of the cuts on the trees, in each plot, is such as to allow approximately four years for bark renewal and in all plots the bark is removed up to a height of 3 feet over this period. The number of trees in each plot is 65 and the distance of planting 16 x 16 feet. During the past four years one or two trees have been lost through various causes so that the number of trees now stands at:—

Plot 1. 64 trees, (one tree cut out in November 1911).
„ 2. 63 „ (one tree cut out in Jan. 1912 and another in Feb. 1913).
„ 3. 63 „ (one tree cut out in June 1911 and another in July 1914).
„ 4. 64 „ (one tree cut out in July 1914).
„ 5. 63 „ (two trees cut out in July 1914).
„ 6. 63 „ (one tree cut out in August 1911 and another in June 1912).

It will be seen that not more than two trees have been lost in any one of the plots. The yields recorded in this report, are the weights of dry rubber actually obtained; no allowance has been made for those trees which have been cut out. This however would amount to a very small proportionate quantity after such allowances had been made in each of the experiments.

	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.
Average girth measurement 3 ft. from the ground at the commencement of expt.	20.5 in.	20.5 in.	21 in.	21.2 in.	21.6 in.	21.5 in
Average girth 3 ft from ground February 1916,	32.4",	31.4",	31.8",	31.9",	~~33.7~~",	33.7", 34.0"
Average increase in girth.	11.9",	10.9",	10.8",	10.7",	~~10.7~~",	12.1", 12.5".

The average increases in girth measurements over the period of 4 years are exceptionally poor, this is most probably due to the close distance of planting.

The total yields of latex and scrap rubber (rubber from bark shavings is not included) obtained in each plot in the 1st, 2nd, 3rd, and 4th years are as follows:—

	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.
First year.	lbs. ozs. 145 12	lbs. ozs. 113 8½	lbs. ozs. 113 13½	lbs. ozs. 108 3½	lbs. ozs. 113 1	lbs. ozs. 91 3
Second year.	203 3	221 0	282 5	225 1	179 1	146 2
Third year.	211 9	173 15	175 10	200 4	124 4	156 12
Fourth year.	338 2	294 3	362 7	339 0	265 2	228 9
Grant Total.	898 10	802 10½	934 3½	872 8½	681 8	622 10

The weights of rubber of the 3rd year comprise only 10 months yield. The fourth year's figures were recorded by Mr. B. J. Eaton, Agricultural Chemist, and the method he adopted for ascertaining the rubber content of the latex was by means of the latex hydrometer.

Remarks on the yields obtained in the various systems for the first two years have been made in a previous article. I intend now to deal with the totals for the four years. A comparison of daily and alternate day tapping, with a similar amount of bark removed, can be made with Plots 1 and 2, 3 and 4, and 5 and 6, the yields being 898 lbs. 10 ozs. and 802 lbs. 10½ ozs., 934 lbs. 3½ ozs. and 872 lbs 8½ ozs. and 681 lbs. 8 ozs. and 622 lbs. 10 ozs. differences of 95 lbs. 15½ ozs., 61 lbs. 11 ozs. and 58 lbs. 14 ozs. in favour of daily tapping. It should be remembered that those differences are per 65 trees over a period of 4 years. The respective yields of daily and alternate day tapping appears to vary considerably on different estates, this is possibly due to the varying conditions of fertility of soil, distance of planting etc. The soil in question is a poor one and the trees planted at 16 x 16 feet.

Opposite Quarters, both in respect of daily and alternate day tapping, have given very poor yields as compared with any of the other systems.

Comparing the output for Jan. 1913 (the completion of the second year) with February 1913 (the commencement of the third year) it is noticeable that, in each plot, there is a very distinct drop in yield but this is only what would be expected considering that in January 1913 the cuts have reached their lowest level on the trees while in February 1913 new quarters and halves have been opened up, the top cut in each case being 36 inches from the base of the tree.

The single V, daily tapping, commencing at 36 inches from the base of the tree and the Single Quarter, daily tapping, two cuts of 18 inches, with similar period of bark renewal, show at the end of four years, 934 lbs. 3½ ozs. and 898 lbs. 10 ozs. a difference of only 35 lbs. 9½ ozs. in favour of the V. The writer does not necessarily support or recommend one, or any of the systems dealt with in this article: it is merely a comparison of some of the systems which were in general use a few years ago.

A scheme of tapping experiments, based on the results of former work, has been drawn up on more conservative lines. All excessive methods of tapping have been eliminated and the period allowed for bark renewal, on young trees, is five years and four months.

First Year Result.

	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6	
	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.
February 1911.	3 7	1 ½	4 1	0 8½	3 13½	1 1½	3 3½	0 10½	3 9½	1 3½	2 13½	0 12½
March ,,	4 2½	1 4	4 1½	0 11½	3 4	1 3½	3 4½	0 9½	2 7	1 10	2 7½	0 13
April ,,	3 1	1 ½	5 15	0 12	3 12½	1 4	5 9½	0 8½	3 5	1 1½	1 13½	0 15½
May ,,	7 2	1 6½	9 2½	0 14	6 8½	1 7½	7 15½	0 15	5 6½	2 1	4 10	1 7½
June ,,	6 1½	1 10	6 1	1 5	6 12	1 12½	7 2½	1 6½	4 9	2 6½	3 10½	1 11
July ,,	6 5	1 14	7 15½	1 6	7 7	2 5½	6 12½	1 6	5 3	2 4½	2 11½	1 12½
August ,,	12 11½	2 3½	8 9½	1 10½	9 9	1 15½	9 12½	1 8½	9 5½	2 7½	5 7	1 11½
September ,,	14 13½	2 2	7 9½	1 4½	8 11½	1 10½	8 2	1 3	7 12	2 1	9 6	2 0
October ,,	16 ½	1 9½	10 11½	1 4½	9 4	1 13	10 1½	0 14½	9 1½	1 14	12 6	1 8
November ,,	18 0	2 1	12 5½	1 6	11 5	1 11½	10 7	1 2½	13 2	1 14	10 6½	1 4½
December ,,	18 7	2 5½	11 9	1 4½	12 1	1 13	10 1	0 15½	11 8½	1 11½	9 6	1 5
January 1912.	14 15	2 ½	11 10½	1 5½	11 5½	1 14	13 5	1 2½	15 ½	2 0	9 4½	1 7½
Total	125 2½	20 9½	99 12	13 12½	93 13½	20 00	95 13	12 6½	90 6	22 11	74 6½	16 12½
Scrap	20 9½		13 12½		20		12 6½		22 11		16 12½	
Total Rubber	145 12		113 8½		113 13½		108 3½		113 1		91 3	

Second Year Result.

	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6	
	Latex Rubber lbs. ozs	Scrap lbs. ozs.	Letex Rubber lbs. ozs.	Scrap lbs. ozs.	Letex Rubber lbs. ozs	Scrap lbs. ozs.	Letex Rubber lbs. ozs.	Scrap lbs. ozs.	Letex Rubber lbs. ozs.	Scrap lbs. ozs	Letex Rubber lbs. ozs.	Scrap lbs. ozs
February 1912.	12 1	1 10	8 9½	1 2½	14 7½	1 11	9 3	0 12	11 1	1 14	5 14½	0 15½
March ,,	10 11½	2 1	8 11	0 14½	14 2	1 12½	10 3	1 1	9 12	1 14	7 1	1 3
April ,,	10 15	1 7½	10 9	1 0	15 4	1 11	10 11½	0 15½	8 6	1 8	8 12	1 1½
May ,,	13 12	1 11½	13 9	1 7½	20 13½	1 14½	13 14	0 15	8 4½	1 10½	11 3½	1 6
June ,,	13 7	1 14	13 4	1 1	20 3½	1 9	14 2	1 5	12 1	1 7½	12 1½	1 2½
July ,,	17 7	1 10	17 14½	1 1	25 0	1 8	18 11	1 1	17 6½	1 8	13 3	1 1¼
August ,,	16 2	1 11	23 9½	1 3	26 6½	1 8	24 10½	1 2	13 9	1 10	12 4	1 5
September ,,	16 12½	2 3	22 13½	1 7	26 1	2 7	24 6	1 6	11 3	2 3	9 7½	1 7
October ,,	19 3½	1 13	22 8	1 3	24 13	1 11	24 10½	1 2	10 11½	1 9	11 13	1 6½
November ,,	17 5	1 10	22 8½	1 3	25 10	1 2½	20 7	0 14	13 8½	1 8½	10 12½	1 10
December ,,	18 4	1 9	24 2½	1 1½	27 10	1 3½	21 8	0 13	21 13	1 6	15 13	1 6½
January 1913.	16 9½	1 5	19 2	0 15	22 6	1 6	20 9½	0 10½	21 12	1 6½	12 7½	1 4
Total ...	182 10	20 9	207 5	13 11	262 13	19 8	213 0	12 1	159 8	19 9	130 13	15 5
Scrap	20 9		13 11		19 8		12 1		19 9		15 5	
Total Rubber	208 3		221 0		282 5		225 1		179 1		146 2	

Third Year Result.

	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6	
	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs,
February 1913	9 11	2 11	8 10	1 15	6 8	3 4	9 2	2 5	4 8	3 0	4 14	3 0
March ,,	9 12	2 8	9 4	1 14	6 4	2 8	10 3	2 6	6 8	3 6	5 12	2 9
April ,,	12 8	2 12	11 4	2 6	6 14	2 14	11 1	2 5	4 4	3 0	6 12	2 8
May ,,	15 2	2 9	14 4	2 5	9 13	2 13	16 12	2 4	4 7	3 1	9 6	3 0
June ,,	14 15	2 8	18 2	2 4	12 9	3 2	22 9	2 10	5 13	3 3	15 14	3 1
July ,,	19 2	2 14	14 4	2 6	15 10	3 1	15 9	2 12	10 1	3 9	17 7	3 2
August ,,	21 3	2 12	12 8	2 5	15 1	3 0	15 0	2 9	11 3	3 11	14 14	3 4
November ,,	24 1	3 0	18 14	2 6	20 0	3 1	22 12	2 12	15 4	4 0	21 6	3 6
December ,,	33 2	3 4	24 10	2 8	30 1	4 8	29 8	4 4	18 1	4 2	23 12	3 8
January 1914	24 0	3 3	19 12	2 2	21 7	3 4	20 10	2 15	10 3	3 0	7 11	1 10
Total	183 8	28 1	151 8	22 7	144 3	31 7	173 2	27 2	90 4	34 0	127 12	29 0
Scrap	28 1		22 7		31 7		27 2		34 0		29 0	
Total Rubber	211 9		173 15		175 10		200 4		124 4		156 12	

Fourth Year Result.

	Plot 1.		Plot 2.		Plot 3.		Plot 4.		Plot 5.		Plot 6.	
	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.	Latex Rubber lbs. ozs.	Scrap lbs. ozs.
February 1914.	16 11	4 7	16 10	3 2	16 5	4 2	19 0	3 3	12 11	4 6	9 7	2 8
March ,,	16 3	3 13	14 2	2 13	21 15	4 2	22 14	2 10	9 11	3 10	8 9	2 5
April ,,	21 4	3 14	15 2	2 13	22 9	3 0	31 0	2 6	12 0	3 1	7 8	2 1
May ,,	26 3	3 8	16 1	3 2	26 0	3 11	19 14	2 13	15 12	3 15	9 2	1 14
June ,,	21 14	4 1	19 9	2 11	32 3	4 6	27 5	3 2	18 9	4 4	17 7	3 0
July ,,	29 6	4 1	25 8	2 12	32 7	3 12	27 6	2 15	26 4	4 2	21 0	2 11
August ,,	30 14	3 15	29 13	3 1	32 0	3 6	31 2	2 10	26 5	2 15	21 0	2 0
September ,,	25 3	3 4	22 14	3 0	25 9	2 14	24 5	3 0	16 2	3 5	17 14	1 13
October ,,	26 10	4 1	21 7	3 4	27 5	3 8	22 1	2 15	16 15	2 15	27 8	3 1
November ,,	29 2	4 2	24 1	3 0	29 10	3 8	23 15	2 12	19 10	3 12	22 9	2 9
December ,,	27 4	3 10	27 10	2 15	30 14	3 11	26 15	2 8	22 14	3 6	26 7	1 15
January 1915.	21 8	3 4	26 10	2 3	22 11	2 15	29 14	2 7	25 6	3 4	12 10	1 11
Total	292 2	46 0	259 7	34 12	319 8	42 15	305 11	33 5	222 3	42 15	201 1	27 8
Scrap	46 0		34 12		42 15		33 5		42 15		27 8	
Total Rubber	338 2		294 3		362 7		339 0		265 2		228 9	

Seed Sowing.

By J. N. Milsum.

The reproduction of plants by seeds is the usual means of the continuation of species in nature and the general method of propagation adopted by the cultivator.

To obtain successful germination of seeds three conditions are essential; that the seeds be in a proper condition for sowing, that the seeds be sown at the proper time, and that the seeds be sown in the proper manner and receive the necessary attention.

1. *Condition of seeds for sowing.*—Seeds may be said to be in the most favourable condition for sowing when they fall from the parent plant, this applies in particular to seeds of indigenous plants, but in the tropics the rule is almost general. The matureness of seeds can usually be ascertained by their external appearance, failing this their weight often serves as a guide. The surest test of the quality of seeds is obtained by making a trial sowing under favourable conditions.

Many seeds having a hard testa, such as Palms and those of certain Leguminous plants, should be soaked in nearly boiling water for a few hours prior to sowing. This is specially necessary when such seeds have been stored for any length of time, as the testa becomes hard and bony on exposure to drought. In certain cases it is necessary before sowing the seed to rub them with a file until the embryo is exposed. Fruit seeds and many seeds of tropical trees and shrubs often require to be washed and sun-dried, in order to remove a kind of glutinous covering which envelopes them and appears to defer germination.

2. *Time of sowing.*—The temperature of Malaya being fairly even throughout the year, allows of seed being sown any time without this factor having to be taken into consideration. The rainfall and condition of the atmosphere, however, affect germination and the growth of the young seedling considerably. It is obvious that seeds should be sown at such a time as to allow the seedlings to make their appearance at the period of the year most favourable to their growth. Thus the seeds of most trees and shrubs should be sown during the latter part of the dry season, the young seedlings making good growth during the ensuing wet weather and becoming well established to with-stand the subsequent drought.

Many kinds of vegetables, where artificial watering can be carried out, should however be treated in an opposite manner.

Experiments conducted at the Kuala Lumpur Experimental Plantation show that the best time to sow seed of the majority of vegetables is at the termination of the wet season, the soil then being in a condition conducive to germination and the plants maturing well during the dry weather. During the exceptionally dry spell of weather experienced in January and February of this year, good crops of several kinds of vegetables were grown on the Experimental Plantation; Radishes and Lettuces being especially good. Tomato seed should be sown at a time which allows the fruit to mature during the dry weather, the plants and fruit being less frequently attached by disease in a dry atmosphere.

Seeds of annuals and other flowering plants can be sown in pots or boxes under shelter any time of the year with apparently equal success, the amount of watering necessary varying with the condition of the atmosphere. During very wet weather little or no water is required, otherwise the young seedlings will damp off; good drainage however to a certain extent eliminates this danger.

3. *Modes of Sowing.*—All seeds require a fine, light, fertile soil to germinate in, to enable the young radicle to make unhampered progress into the soil and the epicotyl to reach the surface and light.

The depth that seeds require to be sown varies considerably but as a general rule it may be taken that the depth of planting should equal the diameter of the seed. In the case of seeds that take a long time to germinate, such as Palms, the seeds should be sown somewhat deeper to afford protection from vermin and exposure to the air by wash.

In the open air there are three principal ways of sowing seeds, broadcast, in drills, and at stake. Broadcast sowing merely consists of sowing the seed over the surface of the soil, which has previously been well worked and levelled. To obtain an even distribution it is often advisable to mix the seed with a quantity of dry sand or earth before sowing, this is specially useful in sowing very small seed. The majority of cover plants may be sown broadcast, the amount of seed per acre required varying according to the size of the mature plant. Centrosema Plumieri, a useful low growing medium sized cover plant, requires about 15 lbs. of seed per acre. Wherever possible, in field and especially garden, seeds should be sown in drills in preference to broadcasting. Not only is it more economical with regard to the quantity of seed required but it subsequently allows of better attention being given to the eradication of weeds and stirring of the soil.

Sowing at stake is not frequently adopted in this country. It consists of sowing the seeds in prepared holes in lines.

Seeds of economic and ornamental trees and shrubs should be sown in nursery beds of well prepared soil. The beds, of a reasonable size, should be well changkolled and enriched with the addition of plenty of well-rotted cow manure and jungle soil; well decayed refuse from rubbish heaps may also be added. Where the soil is inclined to be heavy a quantity of coarse sand should be added. The seeds when sown should be shaded with attaps, and watered when necessary. When the young plants are of sufficient size they may be carefully lifted and planted in their permanent positions. It is not possible to treat certain species of trees, with any degree of success, in this manner, owing to their failing to survive transplanting; such, for instance, as Casuarina equisetifolia, Durio Zibethinus the Durian, Anacardium occidentale (the Cashew Nut), Mesua ferria (the Ceylon Iron Wood Tree), are a few of such trees. The seeds of these should be sown in bamboo baskets containing good soil and plunged into a shaded nursery bed, the young trees being carefully lifted in the basket when sufficiently grown. This method is not only very useful when plants have to be removed from one place to another, but also enables the young trees to be planted out safely at almost any time of the year. A watchful eye must be kept for the appearance of white-ants, as the bamboo baskets appear to attract them.

The seeds of annuals and flowering plants such as Balsams, Dianthus, Phlox Drummondi and Gloxinias may be sown in pots or boxes of fine soil. A good compost for sowing these seeds in can but made up as follows.—Black soil containing plenty of humus, which can usually be obtained from jungle land two parts, loam one part and burnt wood ashes with the addition of a little river sand one part. The addition of a small quantity of well-decomposed cow manure is beneficial. The whole should be well mixed together and put through a fine sieve. A good plan is to place a piece of glass over such seeds as Gloxinias to keep the surface soil from becoming dry, the glass should be removed immediately upon signs of germination. When the seeds have germinated and are of a sufficient size to handle they may be pricked off into pots or boxes until ready for planting in beds or singly in pots.

Minutes of Meeting of the Planters' Association of Malaya.

Held at the Club, Johore Bharu, on January 31st, 1916, at 10.30 a.m.

Present:—Mr. W. Duncan, Chairman,

and the following Delegates:

From Batang Padang D.P.A. ..		Mr. H. E. Darby.
„ Johore P.A.		„ W H. Gawler, Bruce Petrie, E. L. Butler, A. L. Buyers.
„ Klang D.P.A.		„ E. Wakefield.
„ Kuala Lumpur D.P.A. ..		„ W. Leggatt, R. C. Kinder.
„ Negri Sembilan P.A. ..		„ A. Dupuis Brown.

Visitors:—Messrs. C. S. Buyers, C. Bradbery, L. H. J. Willson, A. Vesterdal, Hinar S. Jorgensen, W. B. Campbell, J. B. Douglas, C. T. de B. Whitehouse, C. Fraser, H. F. Moraes, A. Gow, C. F. Moeller, John Andersen, H. M. Watson and H. Anderson.

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1. The *Minutes* of the previous Meeting are confirmed and signed.

2. *Mr. H. M. Darby.*

Mr. *Duncan* regrets the melancholy duty of having to record the death of Mr. H. M. Darby, who was a member since the very inception of the association, and for many years before that a member, and for a time Hon. Sec., of the United Planters' Association, from which the P. A. M. sprang. Mr. Darby, he believed, came to this country about 1895 and at first was engaged in planting coffee and later, beginning with the management of Vallambrosa, he did a great deal for the rubber industry, which at that time was in its infancy. Mr. Darby was esteemed and respected by all classes of the community and as a planter has left a record of which anyone might be proud. By his death the association had lost a valued member and many of them an esteemed and respected friend and he proposed that they place on record an appreciation of Mr. Darby's services to the Association and a vote of sympathy with his widow.

Passed unanimously.

3. *Outside employment on Sundays.* The Secretary reports having written the following letter, as instructed by the previous meeting:

"Kuala Lumpur, 4th December, 1915.

"The Hon'ble Mr. E. Macfadyen,
Kuala Lumpur.

Dear Sir,

I have much pleasure in informing you that at the last General Meeting of this Association held on the 29th ulto., a vote of thanks was unanimously passed in your favour for your whole-hearted efforts in connection with your private Bill to amend the Labour Code on two points so nearly affecting the interest of employer and coolie alike.

The Meeting very much regretted that your valuable assistance in this direction had been of no avail and were much concerned at the views expressed by His Excellency the High Commissioner, when he caused this Bill to be thrown out at the recent meeting of the Federal Council.

Believe me, etc.,
Sgd. H. C. E. Zacharias,
Secretary.

4. *Magistrate at Port Swettenham.* The Secretary reads the following correspondence:

Kuala Lumpur, 4th December, 1915.

Controller of Labour, F. M. S.,
Kuala Lumpur.

Sir,

MAGISTRATE AT PORT SWETTENHAM.

With further reference to previous correspondence on this subject which was further discussed at our recent meeting held on the 29th ulto., I am now instructed to inform you that in view of the present irregular sailings of the B. I. Co., our coolies travel just as much by Chinese and Straits Steamship boats, and that it therefore seems desirable that a Magistrate other than the Harbour Master be stationed permanently at Port Swettenham.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

Office of the Controller of Labour,
S. S. and F. M. S.,
Kuala Lumpur, 29th December, 1915.

Sir,

With reference to your letter of the 4th instant in which you ask that a Magistrate other than the Harbour Master may be

stationed permanently at Port Swettenham, I have the honour to inform you that I am unable to recommend your suggestion to Government, as the experience of the past few months, when an Assistant Controller of Labour has been withdrawn from his other duties to perform the duties of a magistrate at Port Swettenham on the sailing days of British India steamers, shows that the extention of this arrangement would not be justified by the circumstances.

I have, etc.,
Sgd. J. W. C. Ellis,
for Controller of Labour, F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Kuala Lumpur, 30th December, 1915.

Controller of Labour, F. M. S.,
Kuala Lumpur.

Sir,

I have the honour to acknowledge receipt of your letter 28/260 of yesterday and will lay same before my Association at their next meeting.

In the meantime I would like to point out, that from opinions expressed by members at our last meeting, the very fact that the magistrate in question was not permanently available at Port Swettenham, has militated against the success of the experiment in question and has in fact rendered it quite inconclusive.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

Mr. *Leggatt* proposes that the Meeting confirm the last letter written by the Secretary and ask the Government to make a further experiment, by stationing an officer, such as is required, continuously at Port Swettenham, and not merely sporadically as during the previous experiment.

Mr. *Wakefield* seconds the proposal and remarks that most probably the B. I. sailings from Port Swettenham would in future be still less frequent than they are at present.

Passed.

5. *Arrest of Crimpers.* The Secretary read the following letter.

"Klang, 11th November, 1915.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Dear Sir,

I enclose a Report on a Crimping Case heard in the Klang Court, when a counter charge was made against the Estate Manager for illegal arrest and a fine imposed.

This case was discussed at our last meeting and I was instructed to ask the P. A. M. to take up the matter, as my Association was of opinion that it should be lawful for an Estate Manager to arrest without warrant a man caught crimping on his Estate.

I should be glad if you would have the matter brought up at the next P. A. M. Meeting at which Mr. E. C. Wakefield will be present and will give all details of the case.

Yours etc.,
Sgd. C. A. Buxton,
Hon. Secretary,
Klang D. P. A.

Report as to Sungei Rasa Crimping Case.

On the 7th October 1915, a Mandor named Govindasamy, in the employ of a Chetty who owns a Rubber Estate in Malacca, was caught on Sungei Rasa Estate by one Muttusamy Kangany and a coolie named Mydin (both of whom are in the employ of the Bukit Rajah Rubber Co. Ltd.) in the act of attempting to crimp Bukit Rajah Coolies. The man Govindasamy was taken by the said Muttusamy and Mydin to the Assistant Manager's bungalow and was subsequently handed over to the Police.

The Bukit Rajah Co. Ltd. then prosecuted the man Govindasamy and he was convinced of the offence of attempting to crimp coolies and fined $50/- or six weeks rigorous imprisonment.

After Govindasamy had been arrested he lodged an information against Muttusamy Kangany and Mydin, charging them with the offence of unlawful restraint. This charge was also enquired into and Muttusamy and Mydin were both convicted and fined $5/- each.

A further charge was made against Mr. Davidson, the Assistant Manager of Sungei Rasa Estate by Govindasamy charging him with being guilty of the offence of unlawfully confining the said Govindasamy and Mr. Davidson was found guilty of this offence and fined $20/-.

With regard to the two charges of unlawful restraint and unlawfully confining, the facts appear to be as follows:—

Mutttusamy Kangany caught Govindasamy actually on the Estate property in the act of attempting to crimp coolies (of which offence the said Govindasamy was convicted) and he therefore brought the accused Govindasamy to the Assistant Manager's bungalow and left him there. The day upon which Govindasamy happened to be caught was a Sunday when no Magistrate was available to whom application could be made for a warrant to arrest Govindasamy. After Govindasamy had been brought to the Assistant Manager's bungalow directions were given to take Govindasamy to the Estate store and the Estate watchman was told to watch him pending enquiries being made as to what steps should be taken in order to hand the accused over to the Police. The Assistant Controller of Labour was at once communicated with and he stated that he had no power to interfere into the matter but that the Manager of the Estate would be wrong in forcibly detaining the accused. Nothing was done by way of forcible detention, but the accused, of course, knew that he was being watched, and remained on the Estate until Monday morning, the necessary sleeping accommodation and feeding being supplied to him. As soon as practicable on the Monday morning an application for the warrant for his arrest was made and the Police took the accused into custody.

Mr. *Wakefield* describes the capture, on his estate, of a man who was endeavouring to persuade some of his tappers to change on to an estate somewhere in Malacca. He had spoken to five of them in the field and asked them to come with him to Padang Java Station, where he would pay their fares. He also promised them forty-five cents a day. The man was brought to him but as it was on a Sunday he could not obtain a warrant. He was advised that without actually locking the man up he should let him roam about the estate with a watchman to keep an eye on him. The next day he took out a warrant and in due course the case was heard, the man being convicted and fined $50 with the alternative of six months' rigorous imprisonment. The man however, proceeded against him for illegal detention and he was fined $20 and the coolies who had brought him up $5 each.

Mr. *Leggatt* suggests that the Association appeal against this decision, but is informed that the time limit for an appeal has been exceeded.

Mr. *Dupuis Brown* thinks it best to obtain a legal opinion, before they moved further in the matter.

Mr. *Duncan* seconds and would add that the matter be referred to the Standing Committee to take action, after having obtained Counsel's opinion.

Passed.

6. *Rural Boards.*

The *Secretary* reports the receipt of the following letter:

Klang, 17th January, 1916.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Dear Sir,

At the last two meetings of the Klang D. P. A. the "Insanitary Condition of Shop Houses in the Vicinity of Estates" has been discussed and I am instructed to ask you to place this matter on the agenda of the next meeting of the P. A. M.

A resolution was passed by the Klang D. P. A. on 16th Dec. 1915 to the effect that Government be approached with a view to the appointment of Rural Boards, which would have control over villages and groups of shop houses outside Sanitary Board areas. Nearly all these shops supply foodstuffs and the insanitary condition of the premises constitutes a danger to the health of the coolies on Estates.

The following villages or groups of shop houses have been complained of in this district:—

i. Village at 3¼ mile from Klang on the Kuala Langat Road.
ii. „ „ 20th „ „ Kuala Lumpur on the road to Klang.
iii. „ „ 2nd „ Sungei Binjai Road.
iv. „ „ Padang Jawa.
v. Teluk Menagoon, 3rd mile from Klang on the K. Lumpur Road.
vi. Shops on Carey Island.

Should the matter be taken up by the P. A. M., my Association proposes that Mr. Macfadyen be asked to kindly support its proposals, if the question is discussed at the Federal Council.

Yours etc.,
Sgd. C. A. Buxton,
Honorary Secretary,
Klang, D. P. A.

Mr. *Wakefield* says lots of these shops deposited on the sides of the roads all kinds of refuse and filth which undoubtedly bred and spread disease; but as they were outside Sanitary Board limits the Health Officer could take no steps in the matter. He would be interested to hear what the experience of other districts was in this respect. He thinks it was high time that Rural Boards were appointed.

Mr. *Dupuis Brown* points out that Rural Boards actually exist and their appointment went back to the introduction of the Labour Code, when instructions were given by Govt. to the officers of the Labour Dept. to consult Committees, appointed by the Planters' Association of the district, with regard to the administration of the Code. As far as he was aware, there had however been very little demand since for the appointment of these consultative committees.

Mr. *Duncan* thinks it was Government's duty as far as possible to prevent nuisances, and the facts given by Mr. Wakefield were such as to demand the notice of Government. It might be that if the Association to which Mr. Wakefield belonged made representations to the Labour Department, and asked for the appointment of a Committee such as was already potentially at least in being they might get the relief they wanted. If that was done and no good came of it then the question could be further gone into.

Mr. *Wakefield* intimates that this course would be agreeable to his Association.

7. *Currency*:

The *Secretary* read the following correspondence.

Kuala Lumpur, 4th December, 1915.

Under Secretary, F. M. S.
Kuala Lumpur.

Sir,

I have the honour to acknowledge receipt of your letter 4962 of the 21st October, to which I have deferred answering pending our General Meeting of the 29th ulto. I am now instructed to say that the members of this Association are quite agreeable to put into circulation the sum named.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

Kuala Lumpur, 3rd January, 1916.

No. 6 in 4962/1915.

Sir,

Referring to your letter dated December 4th and previous correspondence on the subject of subsidiary copper coins, I am directed to inform you that the Straits Government is not disposed, during the War, to coin more copper and that the question of an additional supply and half and quarter cent pieces must remain in abeyance.

2. There are however in the Federated Treasury at Kuala Lumpur half cent pieces to the value of $2,250 and the Treasury is prepared to issue these to members of the Planters' Association on application after the 10th January, 1916.

3. The coins are in sealed boxes each containing coin to the value of $50 and weighing about 90 lbs. and they will be delivered in quantities of not less than one box at a time in exchange for cheques or bank receipts in favour of the Federal Government account.

I am to request that you will inform the members of the Association accordingly.

I have etc.,
Sgd. S. H. McArthur,
Ag. Under Secretary, F. M. S.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Mr. *Leggatt* points out a misstatement in the Under Secretary's letter of Oct. 21st 1915, viz. that there had been no disposition on the part of all planters to take copper coins. In his district, at least, coolies wages had been paid to the cent for many years; whatever the practice in olden times might have been in districts, where money had to be taken for long distances on bicycles, when no doubt wages were paid to the nearest 5 cent pieces.

As regards the offer now made by Govt., he protested against the trouble and expense to which the planting community would be put by having to take any one kind of coins in lump sums, instead of as required. The onus of distribution surely ought not to be laid on their members, but on the banks, whose business it was to put all coins and notes into circulation.

Mr. *Duncan* reminds the Meeting that the Govt. had asked the Association whether the planters were prepared to undertake the issue of these coins, and that the Association had replied already in the affirmative.

Mr. *Leggatt* proposes that the banks be informed of the offer now made by the Govt. and be definitely asked whether they are prepared to put these coins into circulation.

Mr. *Dupuis Brown* seconds the proposal. It was obvious that if the banks put up a strong resistance, the question would be entirely blocked. What if the Banks refused to accept the money, after it had been put into circulation by planters?

Mr. Leggatt's proposal is carried.

8. *Elephants.*

The *Secretary* reads the following correspondence:

Kuala Lumpur, 4th December, 1915.

Chief Secretary, F. M. S.,

Kuala Lumpur.

Sir,

ELEPHANTS' DAMAGE.

I have the honour to refer to the interview which you were good enough to grant to the deputation from this Association on the 9th Sept. and to a letter forwarded to you subsequently on the 17th Sept. by Mr. Harman Orr, a member of that deputation, substantiating the details of the damage so far done by Wild Elephants in the Sungei Siput district.

The subject came up again for discussion at the recent meeting of this Association held on the 29th ulto., when I was instructed to point out the increasing seriousness of this pest, and to submit that immediate and drastic action be taken in the matter.

I have etc.,

Sgd. H. C. E. Zacharias,

Secretary.

No. 4923/1915.

Kuala Lumpur, 17th December, 1915.

Sir,

I have the honour to acknowledge receipt of your letter of the 4th December, 1915, on the subject of damage done by wild elephants in the Sungei Siput District, and to inform you that the matter has been engaging the consideration of the Government. The question of the responsibility of the Government for damage done by wild elephants was fully considered some years ago and the position which the Government took up then and does take up now is that it cannot accept any responsibility for damage that may be done to private property by any wild animal whether it be

elephants or deer or bison or any of the other wild animals which are to be found in the forests of this country, nor can the Government undertake the responsibility of protecting private property against the depredations of wild animals.

2. It has been suggested that a simple and effective way of protecting rubber estates from the attacks of elephants is to establish patrols for the purpose of ascertaining the whereabouts of the elephants so that steps may be taken to drive them off or otherwise deal with them. In order to test this the Government is prepared, without admitting any responsibility in the matter, to organise for a period of six months a system of patrols in one of the affected districts: the cost and supervision will be undertaken by Government. This will be merely an experiment and at the end of that period, if the owners of estates desire the patrols to be continued, it will be incumbent upon them to make all necessary arrangements and to defray the cost.

I have etc.,
Sgd. E. L. Brockman,
Chief Secretary, F. M. S.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Kuala Lumpur, 18th December, 1915.

The Hon'ble
The Chief Secretary, F. M. S.,
Kuala Lumpur.

Sir,

I have the honour to acknowledge receipt of your letter 4923 of yesterday and to thank you for its contents, which I will convey to the interested parties and, at our next meeting, lay before the members of my Association.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

The *Secretary* also submits the following legal opinion obtained by him:

Kuala Lumpur, 6th December, 1915.

Dear Sir,

The law relating to the shooting of Elephants is contained in the Wild Animals and Birds Protection Enactment 1911 whereby it is enacted that any person who shoots or kills any big game

(which expression includes the elephant) without a licence shall be liable to a fine not exceeding $500 and that any person who shoots or kills any immature big game shall be liable to a fine not exceeding $200.

The Enactment does not deal anywhere with the point which you put to us, namely as to whether elephants can be shot or killed when they are causing damage to property and we are of opinion that, since the provisions of the Enactment are categorical, any person who having no licence shoots an elephant doing damage to property offends against the Enactment. We should be inclined to think, however, that the authorities would not put the Enactment into force in a *bona fide* case under such circumstances and even if they did, the Magistrate would, we should think, not inflict more than a nominal fine.

If an elephant were killed by a person having no licence in self-defence it is clear that no offence under the Enactment would have been committed.

Yours etc.,
Sgd. Drew and Napier.

H. C. E. Zacharias Esq.,
Secretary, Planters' Association of Malaya,
Kuala Lumpur.

Mr. *Duncan* considers they ought to await the result of the experiment in question and in the meantime accept the offer made.

Agreed to.

9. *Contractors.*

The *Secretary* reports the despatch of the following letter:

Kuala Lumpur, 4th December, 1915.

Under Secretary, F. M. S.,
Kuala Lumpur.

Sir,

With reference to your leter 6/1130 of the 15th ulto., I have the honour to inform you that the 2 points kindly referred by you to this Association were duly considered at the General Meeting of this Association held on the 29th ulto., when I was instructed to say that the members of this Association deprecate any further legislation affecting their labour force and that they are satisfied with the existing practice of working a great part of such labour force through Contractors.

I was at the same time instructed to enquire whether any, and if so, which specific reasons had caused this enquiry to be made.

I have, etc.,
Sgd. H. C. E. Zacharias,
Secretary.

10. *Railway Reserves.*

The *Secretary* reads the following correspondence and memorandum of the subsequent interview:

Kuala Lumpur, 20th December, 1915.

General Manager, F. M. S. R.,
Kuala Lumpur.

Sir,

RAILWAY RESERVES.

I have the honour to enclose for your information abstract of minutes of the meeting of this Association held on the 29th ulto.

My Standing Committee have, in accordance with the resolution then passed, considered the subject and suggest that a deputation, consisting of Messrs. Dupuis Brown, H. E. Darby and the writer, wait on you to discuss the matter.

I now have the honour to enquire whether you will be good enough to grant us an interview accordingly, and, if so, inform me of a time and day most convenient to you.

Thanking you in anticipation.

I have etc.,

Sgd. H. C. E. Zacharias,
Secretary.

Kuala Lumpur, 22nd December, 1915.

Sir,

RAILWAY RESERVES.

I have the honour to acknowledge receipt of your letter dated 20th instant and shall be pleased to meet the gentlemen of the Deputation on any day next or following week Saturday excepted between the hours of 9.30 a.m. and 12 noon or 2.30 and 4 p.m. to discuss the questions connected with the above and referred to in the abstract of the meeting of the Association held on the 29th ultimo.

I have etc.,

Sgd. G. H. Fox,
Ag. General Manager, Railways.

H. C. E. Zacharias Esq.,
Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

MEMORANDUM OF INTERVIEW AT OFFICE OF GENERAL MANAGER, F. M. S. R.

Kuala Lumpur, January 4th, 1916.

Present: The General Manager, Mr. G. H. Fox.
The Engineer, Ways and Works, Mr. H. C. Barnard.
Mr. A. Dupuis Brown.
„ H. E. Darby.
„ H. C. E. Zacharias.

Mr. Zacharias having shortly stated the circumstances leading to the appointment of the present deputation, Mr. Dupuis Brown specifies the reasons why they claimed that Railway Reserves constituted a danger to neighbouring estates and is supported by Mr. Darby who adduces illustrative facts.

Mr. Fox points out that the railway reserve had in most cases existed, before adjoining land had been taken up for rubber planting and observes that the Railway was hardly responsible, if estates had neglected to act prudently and omitted to leave a strip of jungle between the reserve and their planted area. He was however only too willing to meet the difficulties of planters in a spirit of mutual helpfulness, which he trusted would be reciprocated.

As regards the first suggestion made, he was quite prepared, provided the Chief Secretary approved, to allow free of charge the use of the Reserve by responsible parties for the purpose of market gardening. In places, where that method was inapplicable, he had no objection to planters eradicating the lalang on these reserves, provided of course the safety of the permanent way was not affected, *e.g.* by scything, planting passion flower etc.; but it was quite impossible for him to assist any such work financially.

Regarding the question of burrow pits, he hardly thought it was generally known, how much his Department was actually doing for the sanitation of their reserves, by draining, oiling etc. But he was quite prepared to consider the necessity of any such further work, if thereby the health of any estate could be materially improved, provided planters would get suggestions to that effect endorsed by their Public Health Officers.

In conclusion, he would ask planters to make all applications direct to the Engineer of Ways and Works at Kuala Lumpur and he could assure them that they would receive every consideration.

Mr. Dupuis Brown expresses the satisfaction of the deputation at the sympathetic manner in which the General Manager had met their difficulties and thanks for the courtesy of the interview.

The deputation then withdrew.

Mr. *Dupuis Brown* amplifies the information supplied by the Secretary and says that it rested now with them to make it known as generally as possible to market gardeners and to encourage them to take up suitable portions of these reserves and cultivate them gradually; which these people would be glad to do in the vicinity of estates with a large labour force.

Mr. *Butler* hopes that the railway will not give permission of occupation without reference to the managers of the adjoining estates. He also fears that some of these market gardens might prove useful places for the receipt of stolen rubber.

Mr. *Duncan* would accept with gratitude the offer made to them by the General Manager, F. M. S. R., and thank him for the way in which he had met their complaints.

11. The *Secretary* reports the following correspondence:

Kuala Selangor, December 10th, 1915.

The Secretary,

The Planters' Association of Malaya,

Kuala Lumpur.

Dear Sir,

The following is a resolution passed at the meeting of my Association held on the 7th inst.

"That all Toddy shops be closed at 6 p.m. instead of at 8 p.m. in view of the fact that most estates are in bearing resulting in tapping being completed by mid-day which gives the coolies ample time to go and get their drink and return to the Estate at a reasonable hour."

The present system allows coolies to remain at a toddy shop till 8 o'clock with the result that they are often not in a condition to return to the Estate the same night and to do a proper day's work the following day.

This of course would only apply to country districts and villages and not to towns.

Yours etc.,

Sgd. J. M. Booth,

Hon. Secretary, Kuala Selangor D. P. A.

Kuala Lumpur, 30th December, 1915.

Controller of Labour, F. M. S.,

Kuala Lumpur.

Sir,

I have the honour to inform you that at the last meeting of

this Association held on the 29th ulto. the sale of intoxicants to estate coolies was again considered.

The general feeling of the meeting was that drunkenness was distinctly on the increase, and the two main reasons for this seem to be lack of supervision of the liquor shops, and the decision of the Government to license the highest tenders without reference to other considerations.

In this connection an illustration was adduced by one member in respect of an estate in Negri Sembilan with a labour force, whose monthly checkroll pay during Jan./June 1915 averaged $3158/- and who informed the meeting that the toddy shop frequented almost exclusively by coolies on his estate, had to pay a licence of $310.50 per month, *i.e.* practically 10% of the total earnings of his labour force!

Another point emphasized was, that no differentiation appears at present to be made regarding liquors drunk on and off licensed premises.

Of remedies the following were suggested, which I was instructed to submit for your favourable consideration:

(1) Larger representation of planters on Licensing Boards.
(2) Restriction of drinking hours.
(3) Enforcing a standard of purity for toddy.
(4) Greater control and regular inspection of liquor shops.
(5) Preferential consideration of estate applications for licences.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

No. 2 in 561/1915.

Kuala Lumpur, 31st December, 1915.

Sir.

I have the honour to acknowledge the receipt of your letter dated the 30th December current, on the subject of the sale of intoxicants to estate coolies, the contents of which are receiving consideration.

I have etc.,
Sgd. J. W. C. Ellis,
for Controller of Labour, F. M. S.

The Secretary,

Planters' Association of Malaya,

Kuala Lumpur.

Mr. *Wakefield* hopes that, when a move is made, it will include the licensing of toddy.

Mr. *Duncan* takes it that, before anything further need be done, they should await a reply from the Controller of Labour to their last letter.

12. *Quitrent.*

The *Secretary* reads the following letter:—

Kuala Lumpur, 4th December, 1915.

Chief Secretary, F. M. S.,

Kuala Lumpur.

Sir,

I have the honour to inform you that at a meeting of this Association held on the 29th ulto., I was instructed to enter on behalf of this Association, a strong protest against a Notification recently gazetted, as a consequence of which no applications for endorsement of titles under Section 3 of the Country Lands Cultivation Enactment 1914 will be entertained by the respective Residents after December 31st 1915; and to submit that this administrative measure, which is tantamount to a repeal of the whole Enactment, be rescinded.

I have etc.,

Sgd. H. C. E. Zacharias,

Secretary.

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13. *War Relief.*

The *Secretary* reads the following correspondence:

Kuala Lumpur, 4th December, 1915.

Under Secretary, F. M. S.,

Kuala Lumpur.

Sir,

I have the honour to acknowledge receipt of your letter of the 23rd Oct. 10/4312 and to inform you that at a General Meeting of this Association held on the 29th ulto., I was instructed to submit to you for nomination on the proposed London Relief Committee, the following 12 names or from amongst them such lesser number as will constitute one third of the whole, as representatives of this Association:—

M. Cumming.
F. M. Porcher.
R. W. Harrison.
Thos. Boyd.
E. B. Skinner.
J. Gibson.
C. Meikle.
H. F. Dupuis.
C. T. Hamerton.
Eric Maxwell.
H. F. Browell.
W. Towgood.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

Kuala Lumpur, 21st December, 1915.

The Hon'ble,
The Chief Secretary, F. M. S.,
Kuala Lumpur.

Sir,

War Relief.

I have the honour to inform you that the total collected by me to date on account of the Planters' War Relief Fund amounts to $17,283.69 from the following sources:

Batang Padang	560.28	
Batu Tiga	740.00	
Kajang	21.00	
Kapar	2,980.00	
Klang	1,450.00	
Krian	1,774.90	
Kuala Langat	507.51	
„ Lumpur	1,136.45	
„ Selangor ..	550.20	
Lower Perak	470.50	
Negri Sembilan	3,314.94	
Taiping	1,652.22	
Ulu Selangor	852.09	
Total for F. M. S. ..		16,010.09
Johore		248.00
Kelantan		202.00
Kedah		413.67
Province Wellesley ..		409.93
		$17,283.69

I have to date remitted £1,500 to Sir William Taylor and am now instructed by my Committee to submit that a similar remittance be made by your Government.

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

No. 4312/1915.

Kuala Lumpur, 29th December, 1915.

Sir,

I am directed by the Chief Secretary to acknowledge receipt of your letter dated the 21st December, 1915, stating that you had up to that date, collected $17,283.69 on account of the Planters' War Relief Fund and had on that date, remitted £1,500 to Sir William Taylor.

2. With regard to your request that this Government should now make a similar remittance, I forward, for your information a copy of a resolution passed in the Federal Council on the 16th November, 1915, and to suggest that the best course be for payments to be made on the requisition of the Committee from time to time.

The Chief Secretary proposes to consult the Committee on this point.

I have etc.,
Sgd. A. Caldecott,
for Ag: Under Secretary, F. M. S.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Resolution passed in the Federal Council on the 16th November, 1915.

"That this Council approves of the payment from time to "time to such a Committee as may be approved by the High Com- "missioner, for the relief of those wounded or disabled by sickness "in the War, of sums equal to the amounts expended on the same "objects by that Committee out of its own funds, provided that "such sums shall not in the aggregate exceed the sum of fifty "thousand dollars."

Kuala Lumpur, 8th January, 1916.

The Hon'ble the Colonial Secretary, S. S.,
Singapore.

Sir,

I have the honour to refer you to a Resolution passed by the Federal Council on the 16th November 1915 in respect of monies raised in the Federated Malay States, to the effect that the Federal Government would contribute sums equal to the amounts expended on War Relief by the London Administrative Committee, provided that such sums do in the aggregate not exceed the sum of $50,000.

A similar resolution I understand, was passed by the Legislative Council of the Colony, the maximum limit being fixed at £10,000; and I shall be much obliged if you will kindly confirm this and also, that such resolution applies equally to such funds as are raised by us in the Colony on account of our "Planters' War Relief Fund of Malaya."

I would add that to date, I have received on this account a total of $19,462.99, distributed, as follows:

Batang Padang	560.28	
Batu Tiga	740.00	
Kajang	21.00	
Kapar	2,980.00	
Klang	1,850.00	
Krian	2,049.90	
Kuala Langat	507.51	
„ Lumpur	1,294.20	
„ Selangor	650.20	
Lower Perak	707.50	
Negri Sembilan	3,314.94	
Taiping	2,011.89	
Ulu Selangor	1,053.58	
Total F. M. S.		17,741.00
Penang and P. Wellesley..		661.00
Johore		248.00
Kelantan		202.00
Kedah		610.99
		$19,462.99

I have etc.,
Sgd. H. C. E. Zacharias,
Secretary.

No. WAR 271/16.

Singapore, 17th January, 1916.

Sir,

In reply to your letter of the 8th instant, I am directed to inform you that at a meeting of the Legislative Council held on the 12th August, 1915, the following resolution was passed:—

"That this Council approves of the payment from time to time to the Prince of Wales' Relief Fund Committee, Singapore, for the relief of those wounded or the relief of those dependents of those killed in the war or the mutiny, of sums equal to the amount expended on the same objects by that Committee out of its own funds, provided that such sums shall not in the aggregate exceed the equivalent of £10,000."

2. This resolution does not extend to any other fund.

I have etc.,
Sgd. E. C. H. Wolff,
for Ag. Colonial Secretary,
Straits Settlements.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

The Secretary reports the receipt of the following collections to date:—

Batang Padang	848.27	
Batu Tiga	740.00	
Central Perak	—	
Kajang	21.00	
Kapar	3,480.00	
Klang	1,850.00	
Krian	2,049.90	
Kuala Langat	507.51	
„ Lumpur	1,294.20	
„ Selangor	650.20	
Lower Perak	707.50	
Negri Sembilan	4,697.10	
Taiping	2,011.89	
Ulu Selangor	1,315.21	
F. M. S.		20,172.78
Malacca	—	
Province Wellesley ..	686.00	
Colony		686.00
Johore		322.00
Kedah		610.99
Kelantan		202.00
		$21,993.77

January 29th, 1916.

Mr. *Duncan* observes that the F. M. S. Govt. are contributing to their fund and the Colonial Govt. to the Prince of Wales' Fund, but that nothing was known as to what action the Governments of Johore, Kedah and Kelantan proposed to take.

Mr. *Gawler* has reason to believe that Johore will fall into line with the F. M. S.

14. *Latex and Rubber Thefts.*

The *Secretary* reports having received a full statement of actual cases of recent rubber stealing from the Batang Padang D. P. A., and reads the following letter from the Kajang D. P. A.:—

Kajang, 29th Jan., 1916.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Dear Sir,

LATEX THEFTS.

I am instructed by my Association to request you to place the enclosed resolution on this subject before the meeting of the P. A. M. on the 1st inst. as, owing to the inconvenient date of the meeting, none of the Kajang delegates are able to attend.

The opinion of this Association is, that the enclosed resolution might form a basis for discussion by the proposed sub-committee, if the meeting of the P. A. M. agrees to form the latter.

Believe me etc.,
Sgd. E. G. Leyne,
Hon. Sec., Kajang D. P. A.

Copy of Resolution proposed by Mr. R. C. M. Kindersley and seconded by Mr. E. N. T. Cummins and carried unanimously at a meeting of this Association.

RESOLUTION.

That a Sub-Committee representing all Associations incorporated in the P. A. M. be formed to submit proposals to the P. A. M. for the purpose of urging Government to take immediate steps to carry out the provisions of the Rubber Dealers' Enactment No. 5, 1909, more especially in respect to the following sections:

Sec. 7. That there is insufficient inspection under this section and that a special department be formed for the inspection of all Licensed Dealers' books and business as in the case of the mining industry.

Sec. 8. That the following addition be made: "That every dealer must enter in his books the acreage under rubber and number of trees being tapped on the holding of every vendor of rubber, and that monthly tabulations should be made by the Licensed Dealer showing the amount of rubber purchased from each holding or title.

Mr. *Duncan* reminds the meeting that the matter under consideration was not altogether new. As far back as June 1913 both the Colonial and the Federal Governments had been approached by them in the matter; and the former had agreed to gazette the names of applicants for licences, so as to give those concerned an opportunity of objecting to a renewal of licences. The Federal Government pointed out that when the Rubber Dealers' Enactment was passed in 1909 the existing staff of the Land and District Officers had been intended to administer the Enactment. Since then Agricultural Inspectors had been appointed throughout the F. M. S. with statutory powers of inspecting the books of licensed dealers; but he had yet to learn that these powers had been exercised by them to some purpose, if at all.

Mr. *Leggatt* thinks the licence fee too small and believes that these dealers form a ring and thus were able to fleece the small holders. Mr. Harvey who regretted his inability of being present, had suggested a good scheme, viz. the establishment of a public Rubber Sales' Dept. under Government control and the abolition of all private dealers.

Mr. *Kinder* would like Government to be asked how many new dealers' licences and renewals had been issued for 1916; how many acres of native rubber there were in bearing and what the crop had been from this area.

Mr. *Duncan* points out that from petty thieving, the evil had grown into an organized system, as many as 20-30 thieves banding themselves together, heavily armed, and not afraid of an Estate watchman or two. The damage done consisting of course not only in the loss of rubber, but more particularly in the harm done to the trees, which took months if not years, to get over the injuries inflicted in the course of a few hours' night tapping. Of remedies, they ought to begin with the issue of licences, in respect of which greater care should be exercised, and thereafter proper supervision of the licensees. However, the question was a pretty complex one and he would recommend that it be referred to the Standing Committee to deal with and that in the meantime all constituent associations send in full particulars of all recent cases and also any suggestions for a remedy, that any of their members care to put

forward. Similar trouble had in the past obtained in respect of tin ore, and if that evil had been stopped, there was no reason why the analogous case of rubber should not be equally dealt with.

Mr. *Darby* seconds the proposal.

Mr. *Dupuis Brown,* is of opinion that moonlight tapping by outsiders is not nearly so grave a danger, as thefts of latex &c. by the labour force of the estate itself. But of course the coolie could hardly sell his rubber to a dealer, since he had no licence. He therefore felt sure that the people who in most cases would receive this rubber were small holders who had a licence to treat and sell rubber, and who in turn could safely sell it to the licensed dealers. The man who owns an acre of rubber could take his 3-4 sheets once a week to one and once to another dealer and would hardly arouse suspicion; and again your own coolie could take rubber from your estate and hand it over the fence to the man who there owns an acre of a Kebun. Thus it was most difficult to trace these thefts. Whilst supporting the proposal, he hopes the point mentioned would receive due consideration on the part of the Standing Committee, when investigating the question.

The proposal is passed.

15. *Export Duty.*

The *Secretary* reads the following letter:—

Singapore, 17th January, 1916.

The Secretary,

The Planters' Association of Malaya;

Kuala Lumpur.

Dear Sir,

We write in case your attention might not have been called to the fact that according to an advertisement in the Gazette, the price of Rubber on which duty is leviable from the 14th to 20th January has been fixed at $230 a picul.

Prices are weaker at present and in the neighbourhood of $180 a picul but even at the height of the recent rise in prices they have not touched anything like $230 a picul and the consequence of fixing a price such as this has the effect of laying the duty payable at a very much higher rate than 2½%.

Writing on behalf of the various Companies we represent we shall be glad to know whether this is not a matter which might be taken up by the Planters' Association of Malaya and a refund obtained for this excess of assessment.

Yours faithfully,

Sgd. F. W. Barker & Co.

Mr. *Duncan* reviews the steps so far taken by the Association and regrets that no reliable London figures had yet become available.

Mr. *Darby* proposes that the matter be referred to the standing Committee for consideration.

Mr. *Leggatt* seconds this and protests that if Govt. wanted to raise the export duty, they should say so in so many words, but that it was a pity to levy the old duty on a fictitious value.

Agreed to.

16. *Malacca Planters' Association.*

The *Secretary* reports the receipt of the following letter:

Malacca, 28th December, 1915.

The Secretary,

Planters' Association of Malaya,

Kuala Lumpur.

Dear Sir,

I beg to inform you that the Malacca Planters' Association have decided to reliquish their membership in the Planters' Association of Malaya.

Yours etc.,

Sgd. Mark Stone,

Secretary.

Mr. *Duncan* doubts not that the Malacca Planters had some very good reason for the action taken, but it seemed regrettable that at this time they should have relinquished their connection. It was important to bear in mind that their Association was not an F.M.S. organisation, but one that was intended to represent the interests of all planters throughout British Malaya and it was obvious, that the more truly they were representative in that way, the more likely would their recommendations be carried into effect.

17. *Agricultural Dept.*

Mr. *Duncan* announces that the Chief Secretary had agreed to the appointment of an Advisory Committee of Planters to assist the Director of Agriculture, who was ex officio Chairman and Convener of that Committee. The Committee was intended to be representative of all districts in the F. M. S. and would divide itself into sub-committees each with a special subject to deal with, such an experiments, diseases, manuring etc. He feels sure that this Committee would be of considerable use in helping the Dept. and would tend in the long run to make the Dept. more practically useful.

There was another point in this connection, in regard to which their wishes had not yet been met, viz. the amalgamation of the Colonial and Federal Agricultural Departments under one head, the beneficial results of which change were obvious; and he trusted that this matter would yet receive the favourable consideration of the Governments concerned.

18. *General.*

The *Secretary* tables notice from Imperial Institute re Monograph on Oil Seeds and Feeding Cakes.

The Annual General Meeting is fixed to be held at Kuala Lumpur on April 26th.

The Meeting terminates at 12.30 p.m.

H. C. E. Zacharias,
Secretary.

Exports of Rubber from British Malaya, (other than the F. M. S.)

State.	Month.	Quantity.
Johore	January, 1916.	lbs. 2,709,923
Kelantan	January, 1916.	lbs. 168,581½
Kedah	January, 1916.	lbs. 654,680
Perlis	January, 1916.	lbs. 420
British N. Borneo	January, 1916.	lbs. 215,825
Brunei	—	lbs. —

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, During the Years 1915 and 1916.

Destination.	Exported during February, 1916.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1916.	Duty collected, 1916, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements	3,593.21	3,310.60	6,903.81	4,155.06	2,748.75	...	21,155,919	
United Kingdom ...	1,410.22	1,072.66	2,482.88	2,486.52	...	3.64	7,549,050	
Continent of Europe	Nil	...	...	1.00	...	1.00	Nil	
Ceylon	116.59	51.69	168.28	146.23	22.05	...	501,035	
Other Countries ...	87.39	35.70	123 09	95.07	28.02	...	365,449	
Total ...	5,207.41	4,470.65	9,678.06	6,883. 88	2,798.82	4.64	29,571,453	766,084.34

KUALA LUMPUR,
6th March, 1916.

E. BURNSIDE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the month of January, 1916.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru ...	...	134.	77.7	85.7	69.9	15.8	73.4	.744	70.4	78.	...	3.58	1.25
Pahang, Kuala Lipis ...	...	...	78.3	84.6	71.4	13.2	74.3	...	...	...	...	7.00	2.68
Johore, Johore Bahru ...	...	...	...	85.82	70.90	14.92	...	...	...	...	...	4.81	...
Singapore, Kandang Kerbau	29.848	159.5	81.2	86.7	72.4	14.3	77.0	.824	...	79.	...	2.40	.46
Malacca, Durian Daun ...	29.803	144.5	81.5	86.	70.6	15.4	78.6	.964	...	89	N.	2.18	1.06
Negri Sembilan, Seremban	...	135.3	78.2	86.	70.6	15.4	75.1	.815	73.1	84.7	N.	2.12	.43
,, Kuala Pilah ...	...	145.1	81.0	91.	72.5	18.5	77.7	.891	75.6	77.8	...	5.20	2 60
,, Port Dickson	...	125.3	80.4	85.6	72.9	13.7	75.9	.812	73.1	78.4	...	5.54	3.67
Selangor, Kuala Lumpur ...	29.836	143.4	80.6	87.5	72.3	15.2	76.1	.816	73.0	78.	N.E.	16.7	6.5
,, Klang ...	...	...	78.9	83.3	72.6	10.7	75.2	...	...	...	...	207.1	44.8
,, Kuala Selangor ...	...	..	...	86.5	74.4	12.1	...	...	...	...	...	200.7	94.0
,, Rawang ...	...	...	...	92.6	...	...	...	...	...	...	...	28 9	20.1
Perak, Telok Anson ...	...	...	80.47	90.	67.	23.	76.02	.841	...	82.		3.06	.96
,, Ipoh ...	...	...	82.18	93.	67.	26.	75.39	.789	73.86	73.	...	3.75	1.00
,, Taiping ...	...	156.	81.56	94.	70.	24.	76.13	.830	...	78.	...	4.90	1.88
,, The Cottage ...	...	...	...	...	...	...	...	...	...	...	...	11.38	2.30
,, Parit Buntar ...	...	...	82.63	95.	66.	29.	76.75	.843	...	77.	...	1.07	.60
Penang, Georgetown ...	29.843	143.3	82.4	89.1	71.	18.1	74.8	.761	71.2	69.	...	1.72	1.02
Kedah, Alor Star ...	...	...	...	...	...	...	...	...	...	...	...	.12	.09
Perlis, Perlis ...	...	...	...	86.77	69.48	17.29	...	...	...	...	...	.09	...